AFRICAN UNION
INTERAFRICAN BUREAU
FOR ANIMAL RESOURCES

REPORT OF THE TRAINING WORKSHOP ON CAPACITY BUILDING FOR FISHERIES STATISTICAL DATA COLLECTION ANALYSIS AND UTILIZATION OF SCIENTIFIC DATA FOR INFORMED DECISION-MAKING IN FISHERIES AND AQUACULTURE

Participants of the training workshop on capacity building for fisheries statistical data collection analysis and utilization of scientific data for informed decision-making in fisheries and aquaculture

5 - 9 SEPTEMBER 2016

CHELSEA HOTEL, ABUJA
FEDERAL REPUBLIC OF NIGERIA

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EXECUTIVE SUMMARY

A training workshop on "capacity building for fisheries statistical data collection analysis and utilization of scientific data for informed decision-making in fisheries and aquaculture" was jointly organized by the African Union Interafrican Bureau for Animal Resources (AU-IBAR) and the NEPAD Agency in collaboration with the Federal Ministry of Agriculture and Rural Development of the Federal Republic of Nigeria with support from the European Union on 05-09 September 2016 in Abuja, Nigeria.

The overall objective of this exercise was to equip Senior African fisheries experts and officials with enhanced skills and knowledge with respect to their ability to collect, analyse and interpret fisheries data so as to better inform fisheries management decisions. The specific objectives were to:

- Understand what kinds of data that can be collected, where and how data can be collected and stored, and also the common problems associated with data collection and storage.
- Create awareness of the importance or relevance of various types (bio-statistical, economic, social, environmental etc.) of data for sound management of fisheries resources.
- Strengthen the capacity for fisheries statistical data collection, analysis and utilization of scientific data.
- Build skills on the use of data to support evidence-based policy and rational management measures with regards to fisheries resource exploitation in African context.

The training was attended by **40 participants** from the following **African Union Member States (AU MS)**: namely Angola, Benin, Cameroon, Cote D'Ivoire, Democratic Republic of Congo, Egypt, Ghana, Guinea, Kenya, Liberia, Mozambique, Nigeria, Republic of Congo, Sao Tome and Principe, Senegal, Sierra Leone, Sudan, The Gambia and Tunisia; **Regional Economic Communities (RECs)**: ECOWAS and UEMOA; **Training resource persons** and **International experts** as well as **AU-IBAR** staff members.

The meeting among others came up with the following outcomes;

i. The Fisheries Managers had an improved understanding of many of the issues associated with data collection, analysis and interpretation of scientific data (biological, economic, social and legal) for informed decision making.
ii. The Fisheries Managers were equipped with the necessary tools and knowledge on international instruments and their relationship and influence to different type of fisheries. There was an improved understanding of what instruments they could consider when making policy and management decisions to ensure compliance and coherence with international best practices

1. INTRODUCTION

1.1 Background and rationale

The rationale management of fisheries requires accurate information from periodic evaluation or assessment of status of exploitation of fish populations and interpretation for decision-making. In most African countries, fisheries management decisions are often taken in arbitrary manner without reference to status of exploited stocks in the EEZs of coastal countries. This has been attributed to the absence of relevant information to inform policy and management decisions and also inadequate capacity to interpret and utilize research data even where they are available. Consequently, fishing capacity still remains excessively high in major commercial fisheries which may not be commensurate with the resource base. The availability of reliable data is one of the prerequisites for informed decision making in fisheries and aquaculture. In order to improve the quality of fisheries and aquaculture statistics, to inform countries, regional bodies and the AUC on the status and trends of African fisheries resources, the AU-IBAR, in collaboration with FAO and NEPAD Agency, prioritized the improvement of information and dissemination on African fisheries and aquaculture through the development of a Pan African Strategy for data collection, Analyses and dissemination for this purpose. The CAMFA I Decisions related to "improve scientific knowledge" and the subsequent Pan-African Strategy on Improvement of Fisheries and Aquaculture Data Collection, Analysis and Dissemination were in response to this call. The aim of the strategy is to provide a framework and guidelines that should lead to improvements in the availability and quality of national and regional data to support fisheries management, aquaculture development and policy development in Africa. African Union member States have in place systems of statistical data collection usually aimed at obtaining information on fisheries production (landings), fishing capacity, species composition and some economic data (mainly price data). Various data collections systems exist in the individual AU member states based on different premises, procedures and assumptions in estimating total fisheries production, fishing effort, value of catch etc. The 2014 Joint Ministerial Conference on Agriculture, Rural Development, Fisheries and Aquaculture also encourage Member States to build capacity for collection, analysis and interpretation of biological, social and economic data for improved decisions making in fisheries management and aquaculture development

An importance area of weakness in a number of management regimes across the continent is the absence of informed decision-making in fisheries management. Rational fisheries management should be informed by management parameters such as Maximum Sustainable Yield, Maximum Economic Yield, Total Allowable Catches or quota-based systems, optimum levels of fishing capacity, biomass regeneration parameters (growth and recruitment), integrated ecosystem models etc. The capacity to interpret and implement fisheries management systems based on these scientific information has become grossly inadequate across the continent. The glaring effect of this inadequacy is, for example, increased in fishing capacity beyond the carrying capacity of fish stocks under exploitation, recruitment failure, changes in species composition and ecosystem dysfunctioning, etc. Thus to ensure sustainable fisheries management, it is important that capacity of the Ministries or Departments responsible for fisheries is developed in interpretation and utilization of fisheries scientific data for implementation of scientific based fisheries management regimes across the continent. This will contribute in large measure to the implementation of a key policy pillar in the policy framework and reform strategy for fisheries and aquaculture in Africa, which is conservation and sustainable use of fisheries resources.

1.2 Participants

The training was attended by 40 participants from the following African Union Member States (AU MS): namely Angola, Benin, Cameroon, Cote D'Ivoire, Democratic Republic of Congo, Egypt, Ghana, Guinea, Kenya, Liberia, Mozambique, Nigeria, Republic of Congo, Sao Tome and Principe, Senegal, Sierra Leone, Sudan, The Gambia and Tunisia; Regional Economic Communities (RECs): ECOWAS and UEMOA; Training resource persons and International experts as well as AU-IBAR staff members. The training workshop was conducted through presentations and graphic illustrations and interactive discussions after each topical presentation. Simulation exercises were conducted on the kind of statistical data collection analysis and scientific information and/or data interpretation in decision-making for fisheries management options.

2. OPENING SESSION

The opening session was facilitated by Mr Obinna Anozie, Policy Analyst for Fisheries and Aquaculture at the AU-IBAR and was marked by two statements from the representatives of AU-IBAR and Federal Ministry of Agriculture and Rural Development, Federal Republic of Nigeria:

Dr Simplice Nouala, Chief Animal Production Officer gave the welcome remarks on behalf of Prof. Ahmed A. El-Sawalhy the Director of AU-IBAR. He highlighted that fisheries management decisions are often taken with difficulty and without reference to the status of exploited stocks in the EEZs of coastal countries. This has been attributed mainly to absence of relevant information to inform policy and management decisions and also inadequate capacity to interpret and utilize research data even where such data are available. The availability of reliable data is one of the prerequisites for informed decision making in fisheries and aquaculture. Thus, the AU-IBAR developed a training manual to enhance capacity of AU member States in interpretation and utilization of fisheries (and ecosystem) scientific data/information for rational fisheries management. The overall objective of this document is to equip the African fisheries decisions makers, experts and/or administrators with the necessary skills and knowledge for enhancing their ability to successfully know and appreciate what kind of data could be analysed to help understand the dynamics of fisheries for rational and sustainable management actions. He thanked the Government and People of the Federal Republic of Nigeria for accepting to host this important event.

Dr Shehu M.U Ahmed, Permanent Secretary of the Federal Ministry of Agriculture and Rural Development, Federal Republic of Nigeria made opening remarks at the training workshop on behalf of the Chief Audu Ogbeh, Honorable Minister of Agriculture and Rural Development. He alluded to over-fishing as being caused by the weak capacities of fisheries administrators with respect to adequately interpreting and utilizing research data for informed management decisions making. This training serves as a stepping stone towards addressing this area capacity deficiency on the continent.

2.1 Adoption of the Agenda

AU-IBAR presented the Agenda. The agenda of the meeting was adopted without amendments with a move for adoption by Ghana seconded by Kenya.

3 TECHNICAL SESSION

The technical sessions were facilitated by the lead consultant, Dr Pete Fielding from OLRAC Consultancy Firm, and supported by Dr Aboubacar Sidibe, Project Officer - Fisheries Resources Management, of AU-IBAR; Mr Kwame Mfodwo, AU-IBAR Technical Assistant; Dr Mohamed Seisay, Senior Fisheries Officer .

The meeting was informed by a series of technical presentations by AU-IBAR, invited speakers, plenary discussions and group work sessions. The following presentations were provided:

3.1 Setting the scene presentations

3.1.1 Fisheries management systems (targets) in Africa – Setting the scene presentation and Background, objective and expected outcomes of the training workshop by Dr Aboubacar Sidibe

Dr Sidibe gave a presentation on an overview of the fisheries management systems in Africa. There are challenges affecting fisheries such as absence of routine data collection systems in most member states; Inadequate training or knowledge on relevant scientific data for fisheries management; though trained but poor or limited technical skills or analytical techniques on interpretation and utilization of data for implementing appropriate fisheries management measures, policy actions, regulations; general absence of mechanism for monitoring (data collection) and information sharing systems for shared fish resources; Limited research institutions and means to fisheries management. Most often data relevant for detailed analytical systems or models are lacking; Weak or non-implementation of exiting polices or regulations; and absence of collaboration or technical know-how in the management of shared resources.

As such the consequences of this challenges has resulted in a weak governance in Fisheries Management regimes; Open access, Overcapacity, over-capitalization or capital stuffing; Overfishing/ over-exploitation of most commercial fish stocks; Recruitment failures, perturbation in ecosystems function (species substitutions, etc.); Declining fish populations and increasing conflicts; Poorly negotiated Fisheries Access Agreements; Weak participation in RFMOs and poor returns; Reduced fish supplies and Food security, poverty and social problems.

Box 1: Fisheries management practices in Africa: using industrial marine fisheries and Small-Scale Fisheries as examples

Industrial marine fisheries

1. Generally not based on informed decisions;
2. In most cases licenses are issued without fishing quotas or total allowable catch; vessels can fish as much as they can within the validity of their licenses;
3. Number of vessels - Fishing effort or capacity - not regulated and not tied down to standing stock or biomass;
4. Statistics of catch and fishing effort data are the common data available and in few cases ; based on these estimates of MSY and optimal effort are made but hardly used in decision-making;
5. Research data (e.g. growth, mortality parameters, maturity) that would support statistical data for comprehensively well informed decision are generally not available;
6. Therefore pertinent information on age or size structure , maturation as input parameters for analytical models (e.g. virtual population or cohort analyses) are often missing;
7. Decisions on management targets are mainly based on biological targets and do not often take into account economic, social and environmental considerations due to lack of data or capacity on these aspects;
8. No information sharing on shared stocks; no data on migratory species, distribution.

Small-Scale Fisheries

1. Virtually open access
2. Monitoring is usually through registration of fishing canoes and fishing gears (e.g. nets, lines)
3. Frame surveys though not on regular basis
4. Due to scattered nature, sample-based survey appropriate
5. But usually no routine catch and effort data collection
6. Difficulty in defining adequate fishing effort and standardization of fishing effort due to multiple gear use – single CPUE not representative of abundance indices
7. In most cases lack of capacity to implement sample-based data
8. Size/age structure of the population different from population structure accessible by industrial fisheries

There are also technical issues involved in fisheries management such as interpreting and translating data into practical management measures; setting limit to fishing capacity (number of fishing vessels or licenses issued); Implementing Total Allowable Catches; demarcating closed areas or closed seasons; limitation on size of fish catch (mesh size); banning fishing gears/fishing methods; negotiating Fisheries Access Agreements.

Irrespective there are options to make informed decisions and fisheries managers should (i) rely on simple less expensive model (just catch and fishing effort data, setting biological MSY as management target (Surplus models?) keeping in mind shortcomings and lesson from spectacular failures, e.g. Collapse of Peruvian Anchovy in 1970s modelled on Schaefer model (ii) invest in research and appropriate capacity development for application of analytic models (Cohort analyses and predictive models (Yield/recruit); the capacity would contribute to comprehensive measures e.g. no take size, closed seasons and areas, quota-based fisheries, etc. (iii) implement Ecosystem Approach to Fisheries (EAF) to balance diverse societal objectives, by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries management."

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3.2 Technical presentations

3.2.1 Marine Environment of the African coast – LMEs, Freshwater Aquatic Environment of Africa by Mr Kwame Mfodwo

Mr Kwame Mfodwo gave a presentation on behalf of Dr Pete Fielding and commenced his presentation mentioning that the African Aquatic Environment is very complex from Coastal Cliffs and Bays, Rocky Shores, Sandy Beaches, to Estuaries and River mouths. Thus there is a massive influence of terrestrial activities on rivers, estuaries and marine environments and what happens in river catchments affects the state of rivers that flow into the sea. This affects the ecology of estuaries, the coast near the river

mouth and often very significant distances on either side of the river mouth. Many very large rivers flow into the sea on the east and west coasts of Africa such as Orange, Niger, Zambezi, Limpopo, Tugela Congo and Volta. Both large and small rivers play a major role in the coastal ecology of the Indian and Atlantic Oceans. Their inland catchments are an integral part of the coastal and fisheries management.

Marine environments are characterized by shallow subtidal reefs, shallow and deep soft bottom substrates, Mangrove communities, Open Ocean, coral reefs and salt marshes.

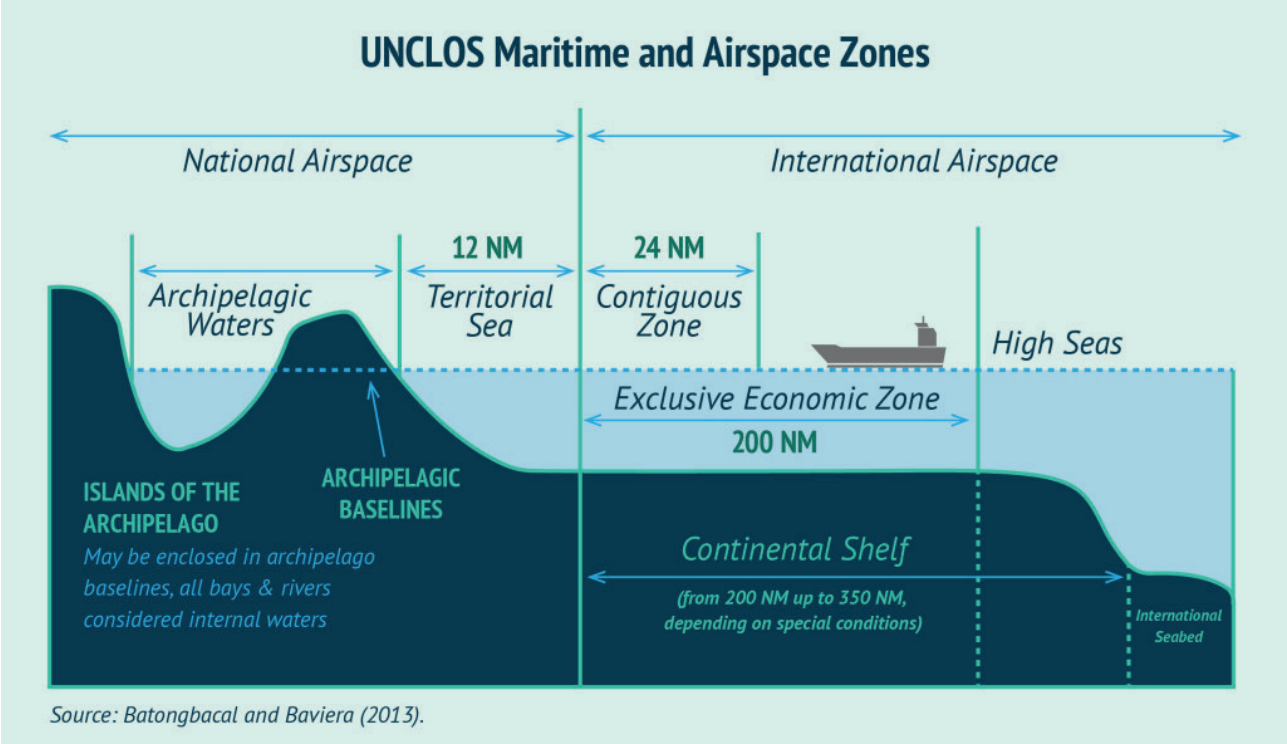

Figure 1: UNCLOS Maritime and Airspace Zones

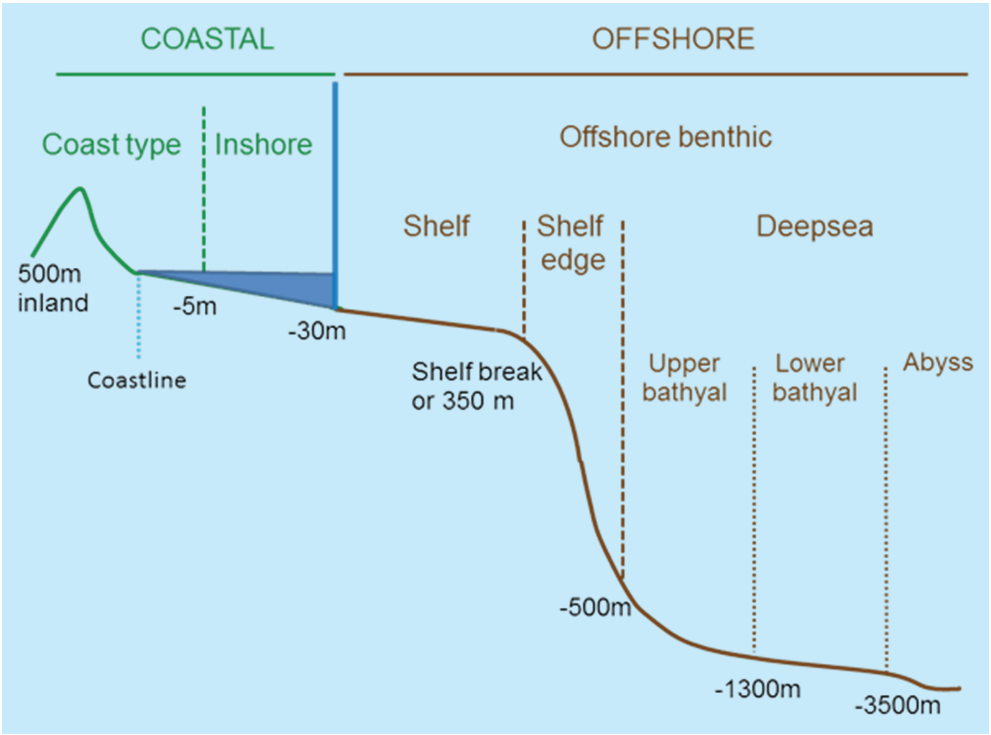

Figure 2: Coastal and offshore zones

The complexity of the marine environments is that elements of the environment are inter-related, Inshore and offshore zones, sandy beaches and rocky shores, Terrestrial, rivers, estuaries and the ocean, mangroves the estuary, the river the coastline, coral reefs and the land and rivers. There is a movement and mixing of sediments, nutrients, pollutants and reproductive outputs. All carried by currents, winds, tides and move inshore and offshore, move up and down the coast, move between countries, and are mixed with other water masses.

The marine environment of Africa is greatly impacted by large current systems that give rise to Large Marine Ecosystems (LMEs). These are Ocean space including coastal areas from river basins and estuaries to the seaward boundaries of continental shelfs and outer edges of major current systems. These are large regions 200 000 km2 characterised by: distinct bathymetry, hydrography, productivity and trophically dependent populations

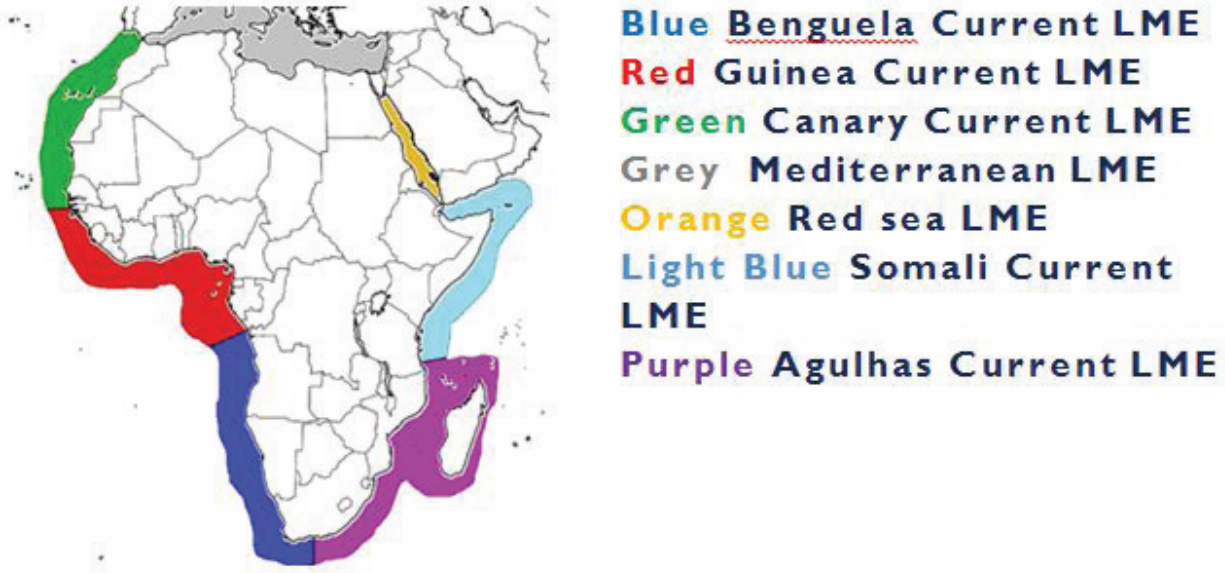

Figure 3: African Large Marine Ecosystems

Mr Kwame concluded the presentation by mentioning major lakes and rivers on the continent of Africa namely Orange River, Limpopo River, Zambezi R, Lake Malawi, Lake Tanganyika, Lake Victoria, Lake Turkana, Lake Albert, Nile River, Lake Chad, Niger River, Senegal River, Congo River and Okavango River. In addition, fresh water wetlands area such as Lake Natron in Kenya, Lake Ichkeul in Tunisia Okavango delta in Botswana, Congo River swamps, Sudd in the upper Nile, Bangweulu swamps, floodplains and deltas of the Niger and Zambezi rivers all provide important ecosystem services to the continent. He emphasised that all of these elements of the African Continent are inter-related, that is, the inshore and offshore habitats of the marine environment, the multiple big and small freshwater lakes, rivers and swamps, the large and small estuaries that link the two thus the management of these systems and their resources should be integrated.

3.2.2 Water model - Illustration of population dynamics by Dr Mohamed Seisay

The Water Model is a way to simplify the complex issues around population dynamics and fisheries management. Each water body has a carrying capacity and naturally it is balanced by the current population, mortality, recruitment and competition. Thus the water model is largely disturbed by fishing efforts such as fishing gears and size, time spent during fishing. The condition within the water model remains optimal during period of decreased mortality. When the fishing efforts have been

increased, the state of water model is at sub-optimal level and recruitment is affected. Whereby species are over-exploited, recruitment is no longer able to replenish population. Optimal conditions entails low fishing effort, population not at carrying capacity, slight decrease in natural mortality and recruitment is sufficient.

This basic water model does not demonstrate the effects of numerous other variables affecting fisheries and fisheries management such an example is growth/size structures. It is crucial for the fisheries managers to make a list of variables not considered in the water model such as:

- Size structure effects on fecundity
- Size structure on sex ratio of a population
- Environmental variables
- Interspecific interactions
- Migration
- Climate change
- Variations in mortality rates with age
- Impact of destructive fishing practices
- Pollution ETC

3.2.3 Introduces the issue of sustainability – what is it? by Dr. Mohamed Seisay

"Sustainable populations and overfishing and the effects of unsustainable fishing and the status of African fisheries"

Dr Seisay commenced his presentation by mentioning that the term "sustainable use" is to meets the needs of people now, without endangering the capacity of meeting future needs. Our wellbeing and survival depend on the wellbeing and survival of the natural environment. The natural environment provides resources (soil, clean water and air, minerals); products (Fish, fruits, firewood) and economic opportunities (social and cultural benefits). Sustainability almost always includes the following issues: natural environment, economic environment, social environment and political environment.

Sustainable Development

Environmental sustainability is a pre-requisite and enabling factor for achieving sustainable development Social political and economic systems are completely dependent on the natural environment

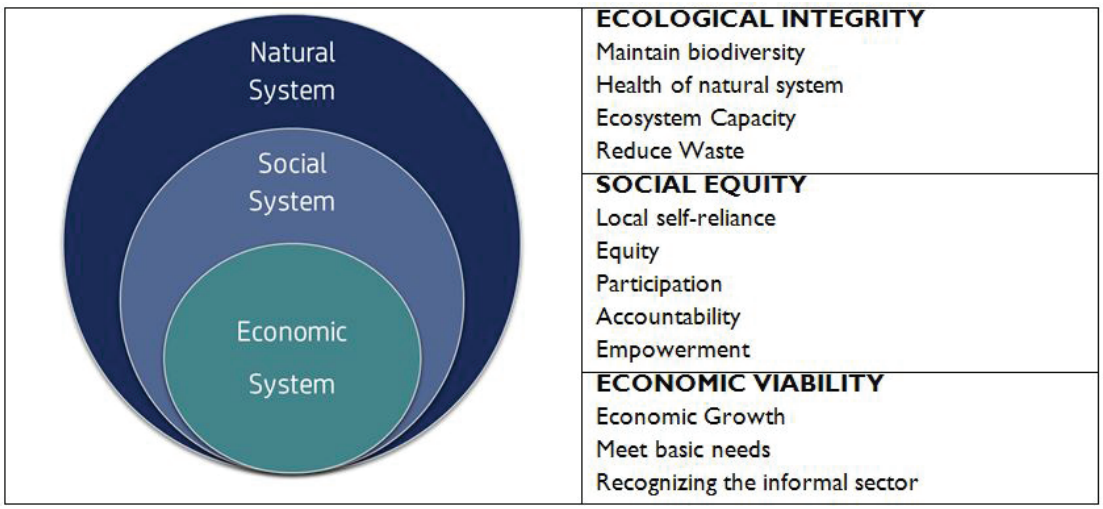

Figure 4: Elements of sustainable development

Sustainable resource use in the context of fisheries management is the (i) management that protects the resource base while allowing and supporting a range of human uses that can contribute to the quality of life. (ii) Particularly of local people who may have few alternatives for their livelihoods and (iii) ownership, historical practices and tenure rights that might impact on resource management. Sustainable Populations are one that can persist through time by means of reproductive processes. If environmental conditions remain unchanged the population will be able to replace individuals lost as a result of predation, other natural mortality and fishing. From a management perspective, it is important to understand that overfishing of a population is generally the result of Recruitment Overfishing and Growth Overfishing. Recruitment Overfishing is when a stock is reduced to the point that not enough young fish are produced to ensure that the stock can maintain itself. If no parent fish are left by the fishery no young fish will be produced. Growth Overfishing when young (small) fish are caught before they have a chance to grow to a size that would provide the optimum yield from a given number of recruits. Practical management focus on single species approach due to poor data. A marine resource is like a factory because fish are produced by other fish it is difficult to distinguish producers from the product (fish).

There are three states of a fish resource

1. Pristine Unexploited State
   Reduction in catch during development of fishery leads to reduction in standing stock. During this early phase annual catch should exceed sustainable yield for reduction of the biomass to persist.
2. Max Sustainable Utilization
   As the resource biomass gets smaller, fishing effort and cost of harvesting will increase. A point will be reached where cost exceeds the increase in catch with increase in effort and fishing effort and catch will level off.
3. Severely Overexploited
   Because the catch level that has been reached exceeds Maximum Sustainable Yield (MSY) the biomass of the resource will continue to decrease. In uncontrolled fisheries, the point of stabilization is economically unviable.

The fishing effort, yield and standing stock can be linked and used to infer characteristics in terms of biological and economic state of the stock. Effects of unsustainable fishing go beyond simply catching too many fish. As populations of fish become smaller, there is a tendency for fishers to: shift to other species (serial depletion) or to smaller size-classes of fish (often reproductively immature). Removal of larger individuals can also change population structure by (i) shifts to a smaller size at maturity (ii) altered sex ratios (iii) smaller individuals generally have a lower reproductive output than larger specimen. Over-fishing of some stocks of certain species can result in lowered genetic diversity. Global marine fisheries data conservatively indicates that bycatch represents 40.4 % of global marine catches.

Discussions, Key Issues arising and recommendations from the presentations

Q: Does a country have knowledge of a number of fishing vessels, fishing activity?

A: Liberia have Automatic Identification System (AIS) installed in their fishing vessels

A: Nigeria have navy coverage with the Gulf of Guinea

A: Sierra Leone utilises the Vessel Monitoring System (VMS) to monitor their seas.

3.2.4 Key provisions in international instruments by Prof Satia, University of Washington

The talk by Prof Satia was introduced by posing this remark to the participants for discussion:

To ensure that there is a rationale management, there is a need to guarantee that the data collected in the EEZ and is the same as the high seas fisheries particularly for the straddling stocks!!

Prof Satia started his presentation highlighting that thirty (30) AU member states are members of seven (7) RFMOs (five high seas RFMOS namely the International Commission for the Conservation of Atlantic Tunas (ICCAT), General Fisheries Commission for the Mediterranean (GFCM), Indian Ocean Tuna Commission (IOTC), South East Atlantic Fisheries Organization (SEAFO), and the South Indian Ocean Fisheries Agreement (SIOFA)) and two inland RFMOS, the Lake Victoria Fisheries Organization (LVFO) and Lake Tanganyika Authority (LTA). Some of the AU member states are parties to 2 or more RFMOs.

Key provisions in international instruments

International fisheries specific and non-fisheries specific instruments are vital to the management of African fisheries because they reflect state commitment to recognized conservation and management doctrines, standards, rights and best practices. The instruments are of two major types: binding and non-binding/ voluntary or soft law instruments. A binding instrument is one that a state or entity which has ratified must follow or be punished. Non-binding agreements show that governments or entities are trying to do something but they accept that they may not always be able to do so because of economic or other reasons. Individually the instruments do not meet the major challenges facing fisheries management and aquaculture development today. However, collectively they provide a very comprehensive and elaborate framework for addressing the major challenges facing the sustainable use of marine and fresh water fisheries resources and the promotion of sustainable aquaculture development.

The principal legal fisheries specific instruments are:

1. United Nations Convention on the Law of the Sea (UNCLOS) of 10 December 1982, which entered into force on 16/11/1994.
2. Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993 FAO Compliance Agreement) which entered into force on 24/4/2003.
3. Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (The1995 UN Fish Stocks Agreement –UNFSA-) which entered into force on 11/12/2001.
4. Agreement on Port State Measures to prevent, deter and eliminate illegal, unreported and unregulated fishing (2009 Port States Measures Agreement, which entered into force on 17 May 2016)

The non-fisheries specific instruments are:

1. Convention on International Trade in Endangered Species (CITES, 1973 Washington Convention), entered in force on 1 July 1973'
2. Convention on Biological Diversity (CBD) (1992, entered into force on 29 December 1993,

3. Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention, entered into force on 21 December 1975
4. International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) (Annex V, Prevention of Pollution by Garbage from ships) which entered into force on 31/12/1988
5. United Nations Framework Convention on Climate Change (UNFCCC) which entered into force on 21 March 1994, and modified at CoP 20 in Paris in 2015)
6. Agreement on the Application of Sanitary and Phytosanitary Measures

The non-binding instruments are:

1. 1. Code of Conduct for Responsible Fisheries (FAO, 1995)
    - Technical Guidelines for the implementation of the Code of Conduct
    - International Plans of Action
    - Strategy for improving information on Status and Trends of Capture Fisheries (FAO, 2003)
2. International Guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication, adopted on 14 March 2014
3. Policy Framework and Reform Strategy (PFRS) for fisheries and aquaculture in Africa

In general, the instruments provide directives and guidance on how to manage fisheries resources and promote the development of aquaculture taking into account biological, economic, social and environmental parameters. The presentations stressed that management measures in the high seas should be compatible to those in waters under national jurisdiction. They also emphasized the importance to collect, analyze, exchange and disseminate scientific information and other data to ensure appropriate decisions are taken to ensure the conservation and optimal utilization of fisheries resources.

Discussions, Key Issues arising and recommendations from the presentation

Q: Nigeria (Mr Ogar Patrick) - the issue of data is key to the management of fisheries. The national government should undertake the research and the coast of Nigeria is too large hence the resources for support must be sufficient. The Ministry is receiving support from the RFBs (SRFC and FCWC), ICCAT etc. is supporting some activities and Mr Ogar called for more support.

A: Prof Satia- when national governments accept national and international instruments they accept to carry out obligations; the same applies to being a member of ICCAT. He mentioned that studies from his students emphasised that Africa is quick to ratify international instruments and slow to implement. The argument on lack of resources is not valid but should be about what is a priority of the national governments.

Q: Nigeria (Mr Ogar Patrick) - Fisheries are multi-specific and does the water model address single species or multi-species.

A: Dr Seisay- tropical fisheries are hard to manage. Population dynamics are concept imported from Europe and most of their concepts are based on age. It is difficult to import all analysis for the African waters. What has been used for scientific research is the Length based analysis due to absence of strong season variations in weather conditions. The single species model is mainly for the temperate. You cannot set a mesh size for one fish whereby the trawler will catch everything. We are not able to use species assemblage to determine the catch size. Approaches now emphasize the consideration of socio-economics dimensions in fisheries management; appropriate adaptation of Territorial Users

fishing rights as options in fisheries management.

3.2.5 Presentation on the overview of fishing operations – What data collection systems and When by Dr Mohamed Seisay

The presentation outlined the limitations of the water model when it comes to evaluating fisheries and fisheries production. Added to this is the complexity of fishing operations themselves in terms of the varied nature of fisheries types, resource user descriptions and capabilities, target species, environmental changes, fishing countries – all leads to a chaotic welter of parameters that influence fish and fisheries and fish production. It is thus difficult to collect the data necessary for managing fishing activities. You need (1) to identify different data needs for effective management, (2) Determine the appropriate resolution of the data that is to be collected, (3) Design means to collect, manage and disseminate data. There are basic irrevocable elements to a fishing operation regardless of scale. Details of data that can/should be collected before a fishing operation (at any scale) starts, at the start of the trip, during movement to the fishing grounds, when fishing operations commence, when they cease and in the course of the return to the home base. Gear configuration and catch data requirements were highlighted, and the need to obtain CPUE data where possible was underlined. In order for CPUE data to be meaningful there has to be standardisation of data collection units – a common language of data collection. The various units that should be standardised were highlighted. Standardised references should apply to country names, fish species names must be standardised and could follow the FAO countries and species codes.

Discussions, Key Issues arising and recommendations from the presentations

- Observer on board will record the time the trawl was released and the catch. For small scale fisheries it is difficult to have enumerator on all landing sites for every fishing day; hence sample-based approach is preferred. For industrial fisheries, it is important to have an observer on board every licensed vessel if we want to have data and information for effective management of our fisheries.
- Deputy Director of Fisheries, Ghana (Mr Pengyir Nemorius) Commercial fisheries is businesses. It is important to have observer programme, we should work toward having every vessel in our fisheries pay a certain fee to cover on-board observer's costs. The government of Ghana is making it a condition for licensing, in Guinea, the fishing vessels owners are paying for the observer programme.
- In Tunisia it is very difficult to collect data for small scale fisheries because of the number of fishers going to sea. The sampling technique was found to be a tool that could be used in this type of situation.
- Senegal has an observer programme with Canadian since 1990 with Schengen boats. When you board the boat you have incur the charges of trip, trying to solve the problem. They have resolved to have on board observers for targeted trips, not for all trips to reduce cost.
- There are two distinctions for implementing scientific and compliance observer as well as Observers and Inspectors. Mozambique have Scientific observer and trying to see if the scientific observer to do the compliance. When it comes to compliance should it be inspectors or Observers. They are trying to implement the Compliance Observer programmes but at initial stages. Mozambique is having challenge defining conceptual issues for effectiveness of the program.
- Kenya has compliance and scientific observer programmes. They have secured the fisheries law. The costs of the observers are incurred by the owners of the vessels.

- Some UEMOA countries apply the observer programmes and some do not. The observer program in UEMOA region is the responsibility of the states. The states are responsible for the final objectives that all fishing vessels should have observers on board. They have a law in the national legislation that every vessel operating in the regional water should be embarked in the observer programmes.
- Congo Brazzaville encouraged the observer program as a key management option. However he raised issues of hold fishing vessels and hygiene on board for the observers.
- Angola- destructive fishing methods - FAO says 30% of fish is caught by bottom trawler fisheries. However, there is debate to ban bottom trawl fisheries, it is not selective and perhaps replace it with gill nets. But how can gill nets going to replace the bottom trawlers for food security. Countries' management priority should guide the decision to ban this gear.
- How do we account for vessels with on board processing units if we do not have observers on boards and transhipment, or compliance to bycatch devices? Hence, having on board scientific observers should be made one of the recommendations of the workshop.

3.2.6 Compliance Issues in Fisheries by Prof Satia, University of Washington

Compliance with and effective enforcement of agreed conservation and management measures adopted by regional fisheries management organizations (RFMOs) in the convention Area of these organizations as well as in national fisheries, supported by adequate monitoring, control and surveillance (MCS) systems are crucial to achieve the objectives of long-term conservation and sustainable use of fish stocks. The UN Fish Stocks Agreement (UNFSA) lays emphasis on compliance especially with flag states. The Compliance Agreement imposes upon all states whose fishing vessels operate on the high seas an array of obligations designed to make the activities of those vessels consistent with conservation and management needs. The agreement further attempts to increase the transparency of all high-seas fishing operations through the collection and dissemination of data about high-seas fishing vessels and their activities. These emphases have been reinforced concerning port states responsibilities in the framework of the Port State Measures Agreement (PSMA).

In addition, RFMOs have adopted specific and detailed measures that place obligations on flag States, such as the recording and timely reporting of fisheries data and cooperation in MCS, including vessel monitoring systems (VMS) and observer programmes. RFMOs have also agreed on procedures to deal with infringements by their members which include the required follow-up actions and reporting. Furthermore, some RFMOs have established specific measures concerning the transhipment and landing of catches and have put into effect trade- and market-related measures. Some of these measures, particularly those relating to port States and trade, extend to non-members of the RFMOs concerned. Many of the provisions in these instruments can be applied to national fisheries.

Fisheries management is a shared responsibility; it should involve the fishery actors, national administrations and strong regional cooperation among AU MS. Regulation of transhipment has been addressed by introducing eco-labelling, traceability and trade measures. The challenge still remains and transhipment happens regularly. It compromise coastal states contributions towards Quota allocation which is based on historical catch. This is detrimental to AU MS who are no able to benefit adequately from their waters resources. Therefore a lot still needs to be done in terms of enforcement of the international instrument to give the opportunity to African states to benefit from their fisheries resources and effectively manage them.

3.2.7 Population dynamics by Dr Aboubacar Sidibe, Fisheries management officer AU-IBAR

Dr. Sidibe made a brief introduction by defining population, species, habitat and ecosystem. Populations are characterised by the size (number of individual in the population), density (number of individual in a given area or space) and distribution (occurrence that can be uniform, clumped or random). Population dynamics is the study of the changes in the biomass or numbers of organisms in populations and the factors which influence these changes. The Four Parameters that affect Population Size or Biomass are birth or recruitment and immigration (increase population), emigration and death (decrease the population). Two Population characteristics patterns or Growth form are Geometric growth form (J-shaped) and Logistic (S-shaped) growth form. Population Fluctuations usually happen when populations reach maximum numbers or biomass for an area. This ensures that the habitat is not damaged through over population. Certain factors lower birth rates and increase death rates to prevent indefinite population increase. This is called population regulation and includes density independent regulation factors (environmental factors) and density dependent factors (competition and predation). Fisheries management decision making must be informed by sound knowledge of population dynamic and factors influencing this dynamic including overexploitation and other natural balancing factors.

3.2.8 Overview of Fisheries Management options by Dr Aboubacar Sidibe, Fisheries management officer AU-IBAR

Traditional fisheries control methods were outlined, as well as modern methods – input (Limit Effort, Limit Time, Gear Restrictions, number of Entrants) and output controls (TAC, Quota, Bag Limits, etc…) and where they are used. Problems with output controls were highlighted, and the problematic issues of most stock assessment methods. All Stock assessment estimates depend on the quality and quantity of information available; quality and type of Data are critical. Operational management Procedures (OMPs) – the way they function, their advantages and their disadvantages were described. Ecosystem based fisheries management is outlined as an alternative fisheries management mechanism and the advantages and problems related to adopting such an approach were presented. Marine Protected Area was discussed as a fisheries management tool. Some of the documented impacts MPAs have played if the management of inshore fisheries demonstrated – higher CPUEs in protected v fished areas, stabilised sex ratios in fish that change sex as they get bigger, and increasing CPUEs in a shore fishery when the area is closed to fishing. All the management option presented could only yield appropriate results if all aspects (social, economic and environmental) are consider when choosing fisheries management option.

3.2.9 Methods of controlling overfishing: The vessels days Approach By Mr Kwame Mfodwo, Technical assistant Fisheries

Mr. Kwame made a presentation of an alternative fisheries management approach "Vessel days Approach" that could be instrumental for African fisheries within RFBs and RFMOs. The method is used by south pacific countries (Papua New Guinea, Solomon Islands, etc…). The approach charges people for time spent in their EEZ, for being in the EEZ and for spending time around the Fishing Aggregating Devices (FADs). For all the countries of the south pacific in the arrangement they make calculation of the total number of days spent in the region and the distribution of benefits at the end is proportional to the commercial value of the fish present in each country's water. Islands without tuna, sell the right for fishing vessels to pass their EEZs. Some countries are charging for fuelling at some islands. The effectiveness of this arrangement is based on a strong regional cooperation and

has been proven to benefit the people of the South pacific Islands as well as an efficient and effective fisheries management option.

3.2.10 Capital Resource Theory by Dr Andrew Baio

African fisheries and aquaculture produces a total harvests in the order of 9.4 million tonnes per annum, with an estimated "first sale" value of just under US $20 billion (AUC and NPCA, 2014). With 12.3 million people employed in fisheries and aquaculture, involved in international trade (export and import) of fish commodity to the value of US$ 10.7 billion per year, the importance of fisheries and aquaculture to the African economy is not in dispute (ibid.). But the continent has failed to fulfil the full potential of the fisheries and aquaculture sector in reducing poverty. Amongst the weaknesses is the failure to appreciate the economic perspective of fisheries management.

Dr. Baio presentation therefore outlined the following:

a. Introduce the concept of capital theory and the theory of investment for participant to appreciate fisheries as scarce capital resources capable of providing streams of benefits in the future which requires positive investment.
b. Identify the biological, economic and bio-economic reference points and their significance in investing in stock rebuilding efforts.
c. Compare and contrast the biologist and economist perspective of concept of overfishing – presenting overfishing as an allocation problem.
d. Demonstrate the backward bending of the supply curve in fisheries (attracting high product prices in the process) as a crucial incentive for overfishing.
e. Show that it is the economic parameters (of price and cost), in addition to the catchability parameter, that put a downward limit on the stock level in open-access fisheries.

The presenter concluded that management regimes are investment portfolio. The property right is what gives you incentive to invest in a resource. The value of the investment is the value of the catch you are forgoing in other to rebuild the stock (your capital). The management of the fisheries should reflect its scarcity because fishery resources are not infinite. As managers we need to take note of the peculiar aspect of the resources (shortage); paradox of value. Overexploitation is the problem of property allocation inefficiency of resources. He gave an example of the World Bank project along West African coastal countries which is mainly on rebuilding their fish stocks. The projects itself focus on rebuilding the stocks to MSY, which is capital for a period of 10 years which represents an investment.

Key Issues arising discussions

- To the concern if models could also take into consideration political will, the presenter noted that politicians do not take into account the all aspect of the management of the resources (social, economic and environmental) when making decision on their use. Political decisions/ influences cannot be integrated in the models for this cannot be controlled or predicted.
- For effective management, the managers should demonstrate to the politicians the models/ graph on how to rebuild the fish stock and need to explain that this is an investment that you need to do and make sure that the society also understands the benefits
- In an open access fishery what drives the increase in effort even though there may be less fish is the resources rent. Because there is no initial cost to access the fisheries, hence people will always go fish. It was also noted that as the fish become scarce, the selling price for a fish is high,

thus keeping the fishing going.

- Could we develop our own models that could take into consideration Africa's specific situation? We need to select one fishery and work out the economic model that could be appropriate for its specific situation.

Observations and Recommendations

It was observed that participants were very enthusiastic in following the Bio-economic aspect in Fisheries management as they could relate to the concepts under consideration in the real world of their circumstances. This generated spirited class discussions and out of class personal informal conversations. However, subjecting participants to the nitty-gritty of introductory bio-economic modelling requires the dedication of more time. This is to allow for building confidence in appreciating the arguments in bio-economic modelling especially as the majority of fisheries managers may not have background in natural resource economics.

3.2.11 Quota Allocation Mechanisms by Prof. Satia University of Washington

Prof. Satia made a presentation on Quota allocation mechanisms in which he underscored the importance of equitable allocation mechanisms for AU member states, members of regional fisheries management organizations (RFMOs). He outlined the key features in allocating shared exploitable resources, the criteria, guidance and mechanisms for allocating of catches and the difficulties of assigning allocations and their implications. He noted that Quota allocation is usually based on political issues that are not easily understandable. For many AU MS it is difficult to meet the needs and criteria that are used to defined the allocation of quota in RFMOs. For all this criteria to be met there is need for time series data. We must identify the most critical data needed that could be of key importance to allocation of fair share to AU MS and define strategies to collect these data.

3.2.12 How fish are caught: types of fishing Gears By Peter Fielding

The presentation provided descriptions and characteristics of the wide range of fishing gears used in Africa fisheries sector. These include Purse seine net, trawl net, gill net, bottom longline, Hooks and lines, Traps, seine net, Lift nets, Cast nets, Hand picking and squid jigging.

3.2.13 Indicators relevant to fisheries management by Dr Pete Fielding

This presentation described some of the theory behind selection of indicators in general. The presentation explained – What an indicator is – Why one selects and uses indicators – the need to link fisheries indicators to the goals and objectives of fisheries management – the desirable qualities of an indicator. Various kinds of indicator were described including Biophysical, Social and Governance. The key issue to be stressed is that it is much more useful to collect a small amount of good data than to collect a lot of poor quality data. Difficulties associated with collecting data relating to the various kinds of indicator were highlighted and the presentation ends with a brief discussion of the process of evaluation - the analysis and interpretation of data.

3.2.14 Why manage fisheries by Dr Pete Fielding

The presentation gave general overview of the necessity for managing fisheries. The over-exploited state of a number of fisheries was highlighted and the fact that over-exploitation of fish resources has more than just biological consequences. There described the Tragedy of the Commons and this phenomenon is related back the need to manage fisheries. Open access is not an option and there is a requirement for control – relate back to the various fisheries management options discussed

earlier and the Bio-economic models. The reasons under-pinning the collection of data were briefly outlined and the multiple consequences of not collecting data to inform fisheries management including Trophic cascades, no catch monitoring, no idea of social impacts of fishing, increased poverty, economic losses, no idea of sustainable yield or effort, no idea of economic efficiencies etc.

GROUP WORK

Following all the presentation and discussions, an exercise was proposed to participants who formed four groups (two Francophone and two Anglophone). The following questions were addressed:

Each group presented their work at a plenary session and question/discussion were asked and addressed. The following key issues emerged from the discussions

- With regards to species composition and nomenclature in small scale fishers who do not know scientific name could use local name. However, managers were advised to adopt FAO species code and emphasised that countries should not re-invent the wheel and should abide by species code.
- Standardisation is a big issue between the gill nets and trawler. Standardization can be done by the CPUE of the dominant gear both for industrial and artisanal. Once standardised data should be easily be compared.
- To the question how do you get fisheries data, when you have both small scale and industrial fisheries? The Nigerian delegate said for artisanal fisheries they get data from the states where the enumerators are to collect the data. Federal inspectors are represented at the states in collaboration with the enumerators. The inspectors get the report from enumerators, examine it and submit to the Federal Ministry. Also by having catch and frame surveys perhaps once per year since it is costly. For commercial fisheries, the Federal ministry have fisheries Officers on board vessels exploiting their EEZ.
- Complex African fisheries (multi-species, small scale and industrial) there is a need to solve the problem of un-harmonised data. e.g. if the country can prioritise industrial fisheries for economic benefits. On the other hand, artisanal fishery is important for Africa's livelihoods. Hence, the data need and the collection method must be harmonized and standardised based on the type of fishery.

After very interactive discussion on the exercise, Dr. Peter Fielding concluded the exercise and noted that the aim of this exercise was to demonstrate that there are a vast number of problems in data collection in our African fisheries. Managers have to devise ways to get required information on status and impacts on the fisheries and species. They have to solve the problem of harmonised data collection at all scales. The managers should make decisions without undermining one fishery. The most important thing is to collect relevant data on both scales of fisheries but the analysis can be different based on the target objective.

Discussions, Key Issues arising and recommendations from the presentations

Q: Angola- with regards to species composition and nomenclature. For small scale fisheries, daily catch sheets, species A, species B etc. how do you help people to enter different species

A: Tunisia- same species recorded at different regions. They say sardines, towards the North is called sardinella, and fishermen do not know the scientific name and use the common name to make it easier.

A: Dr Seisay- FAO species code and emphasises that the country do not re-invent the wheel and should abide by species code. The FAO statistics have labelled that the other species not labelled as "any other species not recorded"
A: Dr Seisay- Standardisation is a big issue in small-scale fisheries and that there is a formula which shows standardization of effort based on the dominant fishing gears in terms of fishery production in the small-scale fisheries. Once standardised it should be easier to compare data.

Q: How do you get data from your fishery i.e. artisanal and commercial fisheries?
A: Nigeria- Artisanal category, get data from the states and have a committee in each states. Federal inspectors are represented at the states in collaboration with the enumerators. The inspectors get the report, vet it and submit to the Federal Ministry. Have catch and frame survey and conduct the survey as Federal ministry perhaps once per year since it is costly. For commercial fisheries, the Federal ministry have fisheries Officers on board. You need methodology, survey of enquiries.

For artisanal fisheries also get shrimp the same as the industrial fishermen. For artisanal fisheries get complex of issues, have different species, pelagic the same applies to industrial fisheries. What is important is to get all the complexities and get standardising. If you collect good information, one sector can compliment

Q: What is the scale of artisanal and industrial for managing fisheries management?
A: Need to solve the problem of un-harmonised data for e.g. if the country can prioritise industrial fisheries for economic benefits. On the other hand, an artisanal fishery is an important for Africa's livelihoods. You can split the data by stocks or area. The data collected has to be standardised per fisheries. Industrial fisheries- can look at vessel used and perhaps be prioritised.

Q: Angola- Not consistent in collecting data, tonnes or kg, mt or fuel. When data comes to the office for analysis is quite difficult, consultant could provide data quality control strategy.
A: Data captures do not understand what are they capturing and why are they capturing data. You need to train the Enumerators.
A: Dr Seisay- at the beginning you need to have conversion factor for the entire different units. A validity survey is required on periodical basis to ensure the veracity of your sampling method in the small-scale, especially with regards to CPUEs. In service training of the enumerators is critical. The ministry that records catch should provide the measuring scale.

Q: Sudan- three levels of government and sourced funding from UNIDO to conduct data. It is important to train people to collect data
A: important to incorporate the data at all levels of government. Start small within the country and continue as you go.

Q: Difference between frame survey and enumerations and good sample size
A: it is easier to estimate the baskets per weight, so that when enumerators submit data it is easier for the ministry to do the analysis.
A: Balance to be made on how much you can collect and what sort of variance you have to live with. Frame survey- particular aspects for e.g. fishing vessels that are functional. Total concept of what the enumerators are collecting. For e.g. Sampling 15% of 500 landing sites you can have accuracy of 19%. For the mathematical you need to calculate the relative error, to get acceptable precision accuracy.

Sometimes you have to look at the high coefficient variation.

3.2.15 Data Capturing Methods in Fisheries by Dr Pete Fielding

The presentation provided an overview of data capture methods – from paper logbooks to electronic logbooks. The operations of each were described in detail and advantages and disadvantages of each outlined. Electronic logbooks provide very powerful fisheries management tools but they are expensive and require some training to be able to use these equipment. Compromise solutions are suggested based on the capacity of each country to acquire these technologies.

3.2.16 Utilization of Socio-economic and Cultural Data for Informed Decision-making in Fisheries and Aquaculture by Prof Paul O. Onyango

Managing fisheries requires periodic evaluation of fisheries performance. To do this it is important to set up a monitoring program in all aspects of fisheries including socio-economic and socio-cultural factors. This is because fishers are social human beings who go into fishing for social, economic and cultural reasons. Without information on these aspects understanding the performance in fisheries as well as the changes in the natural system becomes a challenge. This document provides a short guideline to fishery managers and practitioners on the periodic socio-economic data management in both capture and aquaculture fisheries.

Fisheries sector in developing countries especially in Africa are normally underfunded. As a consequence of this, fisheries authorities cannot respond effectively to the perennial and ever increasing illegalities in the fisheries. In addition it is important to develop skills in packaging information and be able to make a case to the governments to allocate adequate resources for the sector.

Fisheries are important contributor to food supply and security, fisheries contribute to the economy, and fisheries have an impact on the ecosystem. The only way to establish this importance is to collect relevant data for an informed decision-making. FAO (1998)[1] have argued that

> "Planners and managers need to understand the dynamics of the fish stocks, fishery operations, infrastructure, communities and individuals involved in the fisheries sector in order to set policy and manage fisheries. Data collection and analysis, for example, can provide information on how fishers are likely to respond to different policies. Constraints on production and development of new fisheries can be identified. Prices and cost changes in the fisheries can be assessed. Stocks likely to receive increased levels of exploitation may be identified before resource levels drop to a crisis point" (1998:6)

Planners and managers should appreciate that fishing community's behaviour towards fisheries resources is a reflection of their (fishing communities) cultures. The community or individuals within these communities interacts with the fish resources through technology, labour and institutions (rules and regulations). Their exploitation of these fish resources is in accordance with the community's values, goals and objectives. Resource management should therefore set management goals and objects in such a way that it considers and incorporates communities' goals and objectives. Therefore cultural values held by communities will lead to socio-economic activities that are either positive or negative to the biodiversity.

[1] *FAO (1998). Guidelines for the routine collection of capture fishery data. Prepared at the FAO/DANIDA Expert Consultation. Bangkok, Thailand, 18-30 May 1998. FAO Fisheries Technical Paper. No. 382. Rome, FAO. 1999. 113p.*

In this Lecture, a broad definition on fisheries management is given as "managing fisheries is managing people". This is grounded on the fact that fishing communities are in fishing as a way of maintaining their communities and generating incomes. For this reason it is important that planners and managers also take these community concerns in managing fisheries resources. For example managers are faced with challenges on whether to reduce the effort or putting fish on the table, increase foreign currency or improve local incomes, conserve, protect or promote wise use of fisheries resources and decide whether to make human beings happy or the fish happy.

In managing fisheries it is important to always focus on objectives. What objectives are you interested in achieving for certain period of time. It is the objectives, which will determine the type of data to collect. Objectives can be set in four different categories comprising biological, economic, social and political objectives. These must be balanced to be able to meet at least the minimum standards for various stakeholders in the fisheries.

Depending on the objectives set, a strong monitoring program comprising biological, economic, social and political needs to be set in motion. It is in this program that data is generated analysed and management undertaken based on what the data shows. For socio-economic and cultural aspects examples of data types that could be of importance include abut not limited to.

Table 1: Socio-economic and cultural data Types and variables for fisheries

Data Type	Variables
Distribution of fishing incomes	
Earnings (both capture and aquaculture)	Earnings for each crew member (e.g. catch value added, share system or wage rates); Earnings for each fishing household (through fishing, fishing-related and other jobs);
Demographic data	Number of members in each household; age; sex; ethnicity; target fishery or fisheries; community of residence
Distribution of fish consumption	
Landings (Capture and aquaculture)	Quantity by use (food, non-food).
Imports and exports of fish and fishery products (Capture and aquaculture)	Quantity by use (food, non-food).
Nutrient intake	Per capita fish consumption by age, region etc
National population	Numbers of people by region, community, fleet, and demographic variables (age, ethnicity etc.)
Food sharing patterns	cultural rules for food distribution in general; specific foods required for ritual use
Institutions controlling access to fisheries	Type, jurisdiction, location, nature of access granted Community festivals, community organizations associated with fishing, duration of community organizations
Rules	Rules for each institution
Conflicts and co-operation	Networks, relations between and within institutions
Use of local knowledge	Procedures for incorporation of local knowledge, types of knowledge incorporated
Cosmology	Cultural requirements for particular fish products, taboos for closed areas, periods or species; Other beliefs or taboos related to fishing or fishing types

Source: Adapted from FAO 1998 and authors own ideas

These are a few areas which socio-economic and cultural data which can be thought of. More data types and variables can be identified. Planners and managers can generate more variables depending on their context and needs.

The lecture then introduces how to use data analysed from the monitoring program to make decisions. An example of Lake Victoria Nile perch fisheries is given

Discussions, Key Issues arising and recommendations from the presentations
Q: Nigeria (Dr Mohamed Mau'za): Fish consumption per capita varies from one country to another. In Nigeria is 17.5. He needs to understand the calculations and parameters. Used the figure to calculate the annual fish consumption
A: fish that is available in the country remove the exports and the population. Sometimes people consider in the country and also some use total catch.

Q: Mr Anozie- Strategies for engaging the stakeholders.
A: Is possible when allowing the fishermen to take a lead.

Q: Dr Sidibe- Fishermen also participate in the survey.
A: WWF trained BMUs to collect data using forms online. They are synchronising the information with the Ministry of Fisheries. The University of Dar es laam is developing an information system (no of fishermen, catch). This will inform the fishermen, policy makers and consumers.

Q: Ethical dilemma since some data has sensitive information.
A: collect data that follow sensitive issues should apply country ethical rules. What is important is to get "consent".

Q: (Dr Pete Fielding): How to ensure standardisation of data for the countries sharing the lake?
A: countries sharing the lake conduct the frame surveys together and the report is produced for the region.

Q: (Dr Mohamed Seisay): What kind of quality assurance measures have you put in place?
A: Catch assessment, this should include capacity building in data collection, species, identification of fishing gear.

The fourth day was entirely reserve for practical exercises in an attempt to bring together some of the concepts and issues that have been covered in the previous 3 days. Initially there is a PP presentation about Surplus Production which underlies catches and the relation of Fishing Effort to Catches and Surplus Production and Economic Yields. Most of the day was devoted to the analysis of case studies which required participants to assess a data set(s) and make some management recommendations based on the results their analysis.

Case study 1:
Participants were provided with a 10 year data set spanning 2004 – 2014 recording inshore rock lobster catches. Case study would involve doing data analyses and evaluating. Data was recorded in columns and the relevant columns were as follows:

Year
Date = Month and year
Zone = Area of fishing operation
Angler = the gear used. D=Diver catches: A = Angler catches: 0 = Trace catches. Most data come from diver catches.
No. collectors (in the party)
Number = Number of lobsters caught by the diver or divers
Time spent = the time the diver(s) spent catching the lobsters.

Each record represented a complete diving trip because the catches could not be counted until the diving trip had finished. Same applies to the different gear types.

They were also given the option of examining a basic spreadsheet model that looks at the interaction of Biomass, Catch and Surplus Production. Participants explored catch and effort data and the relevance to fisheries economics in management, defining Fishing Effort and the need to standardize Effort (fishing gear limitations, sea days, fishing seasons, minimum size, marine protected areas, other examples). The exercise also put emphasis on the types of data needed for management (Effort, Catch, Biological, Socio-Economic, Environmental, Other population dynamics (e.g. growth, mortality, recruitment parameters- for application of age or length structured model) and the advantages.

Case study 2: Scenario and exercise on data issues within the framework of international instruments
The simulation scenario and case was aimed to facilitate discussion and enhance understanding of the issues of fisheries management in relation to international instruments.

Participants were requested to use their experience, information and knowledge provided in the workshop and the elements given under the section on international instruments relevant to African fisheries management to solve hypothetical problems that four coastal states of the African Union which are members of a hypothetical RFMO, the Zomba Regional Fisheries Organization (ZRFO) are facing with regards to combating IUU fishing, compliance and enforcement and in the allocation of quotas. The requirements for the exercise are presented below.

A. Outline the collaborative data requirements and forms of information exchange that you would need to collaboratively adopt to combat IUU fishing
B. Devise a low-cost compliance and enforcement programme for the fishery and indicate the importance of these mechanisms in line with international instruments relevant to fisheries management. What data requirements would need to be met to make this compliance and enforcement programme effective?
C. Introduce a quota allocation scheme for the demersal fishery based on the following facts:

Table 2: Shared mixed demersal fisheries in the ZRFO region

Year	Catch (mt)	Effort (fishing days)	CPUE
2000	1700	4312	2.536471
2001	1980	4322	2.182828
2002	2078	5111	2.459577
2003	2541	5009	1.971271
2004	1625	3520	2.166154
2005	1777	4000	2.250985
2006	2003	4000	1.997004
2007	2666	4000	1.500375
2008	2545	4512	1.772888
2009	1999	3670	1.835918
2010	2313	3222	1.392996

Participants in four interactive groups discussed, analysed and presented the results of their work in a plenary session that was followed interactive discussions, questions, and clarifications. The following issues were outlined from the exercise and discussions.

- For international instruments to effective serve the AU MS, there is need for ratification and domestication by member states, so that there are parts of their implementation strategies. Participants were encouraged to stimulate and inspire their government to ratify and domesticate these instruments: "Brighten the corner were you are". Be the agent of change back home.
- The important of collaboration and coordination between national and regional institutions for a successful fight against IUU in our countries and regions was emphasised during the exercise.
- It was noted that is very difficult to transform the fishers into fish farming as an alternative livelihood. However, given the current status of our fisheries we must avoid thinking that the change is not possible, if we can show to fishers that it is for their good that they have to do an alternative activity like fish farming it is possible for some of them to adopt it. It is important to show how putting in place this measure will help to rebuild the stock in their fisheries.
- In your making management decision with a high CPUE you also need to take into account the distribution of the fish population (schools) to avoid to make a decision that will lead to complete depletion of the stock and destruction of the fisheries. In-depth research is needed in this case taking into account other ecological characteristics of the species.
- This exercise showed the challenge Africa union MSs go through because lack of data to convince the international community when allocating fishing quotas and hence, do not participate effectively in changing the international convention on quota allocation or fisheries management.

The last day was reserved was experience sharing and selected member states were given the opportunity to make a presentation highlighting the current fisheries management practices and challenges faced in their respective countries. Participant from the following countries shared their county experience with the rest of the meeting:

- Ghana (Western Africa region)
- Cameroon (Central Africa Region)
- Kenya (Eastern Africa Region)
- Mozambique (Southern Africa Region)
- Tunisia (Northern Africa Region)
- Nigeria (West Africa region)

After each presentation, there was an interactive discussion among participants learning from each other experience. This exercise revealed that there are many initiatives with regards to managing fisheries resources in AU MSs e.g.: updated regulations and enforcement, electronic monitoring program for IUU fighting, fisheries management plans, managing fishing effort and capacity, biological stock assessment, protection of marine habitat and biodiversity, products certification management and reduction of post-harvest losses. However most of these countries face challenges related to data collection in their fisheries (small scale and industrial), managing over capacity in the small scale fisheries, effective involvement of fishing communities in the management programs, fund limitation and limited capacity to take advantage of international instrument in quota allocation etc…

The experience sharing session further highlighted the need to for regional collaboration and cooperation for effective fisheries resource protection and management in African Union member states. The need for involving local community in the management effort was also strongly emphasised as in the Kenyan example with beach management units (BMU)

Wrap Up

Following the countries sharing of experience the training facilitators were given the opportunity to wrap up the training session and provide key messages.

As a take home message, the following emerged:

- Fisheries managers must have a good understanding of the entire fishing environment (how fish live, how fish are caught, the operational characteristics of any fishery, how data can be collected and stored, How one can manage a fishery , clear management objectives of fisheries)
- The need for African countries to ratify international instruments that are important for fisheries management and domesticate those in their national frameworks.
- Economic perspective of over fishing showed that overfishing is driven by profit or resource rent. Fisheries managers must have an understanding of this aspect in order to be able to make informed decision. We may need to introduce the property right to avoid the strategy of the common or at least management must insure strategies that show the common responsibility to preserve our fisheries resource.
- Balancing objective for fisheries management taking in consideration (Biological, socio-economic and political) aspect is critical for effective management decision making. Balanced harvest: fishing as many sizes and species as possible in proportion with natural productivity. Hence the importance of data to inform the entire process.

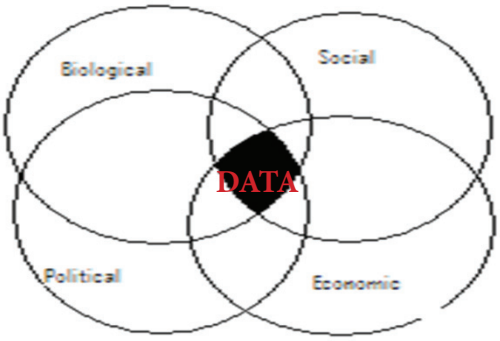

Figure 5: Matrix of Effective Fisheries Management Decision Considerations

4 OUTCOMES OF THE MEETING

The meeting among others came up with the following outcomes;

i. The Fisheries Managers had an improved understanding of many of the issues associated with data collection, analysis and interpretation of scientific data (biological, economic, social and legal) for informed decision making.
ii. The Fisheries Managers were equipped with the necessary tools and knowledge on international instruments and their relationship and influence to different type of fisheries. There was an improved understanding of what instrument they could consider when making management decisions at national, regional or international level.

5 CONCLUSIONS AND RECOMMENDATIONS

The workshop contributed to strengthening the capacities of participants in the collection, analysis and use of statistical data on fisheries for making informed decisions. At the end of proceedings, the recommendations were made as follows:

African Union

The participants commended African Union for such an important initiative designed to improve fisheries management and aquaculture development and expressed:

i. The need for allocation of more days for the training to allow for increased and much better understanding of concepts, techniques and skills of data analyses and their interpretation for rational fisheries management and responsible aquaculture. Additionally the participants also requested for a repeat of the training
ii. The need for strengthening research institutions and foster linkages between research institutions and the institutions in charge of fisheries management and aquaculture development
iii. Facilitate establishment of regional or sub regional collaboration for data collection and harmonization of systems, especially for shared fisheries and aquaculture resources
iv. Support the coherence of existing regional and sub-regional initiatives on fishery data collection particularly with regard to the recording of effort

Member States should

i. Implement primary data collection on biological, economic and social issues to support informed and rationale decision-making
ii. Strengthen research institutions and foster linkages between research institutions and the institutions in charge of fisheries management and aquaculture development
iii. Train continuously enumerators and observers/compliance officers on accurate data collection, methodologies and reporting
iv. Member states should increase support (e.g. budget, logistics etc.) to data collection to support informed decision-making
v. Implement strategies for regional arrangements to consider Minimum Terms of Conditions for Access including Vessel Day Scheme
vi. Implement provisions of continental and international fisheries and aquaculture instruments and to increase compliance with RFMOs
vii. Implement fisheries management plans and regimes to be supported by appropriate data

viii. Implement scientific and compliance observer programmes. There is need for member states to have provision for costs of observer programmes to be taken charge of by authorised fishing industries/countries/agencies to insure effective and sustainable data collection and observation of the fishing activities at high sea. The costs of the Observer programme should be incorporated in the fishing licences or some appropriate mechanisms to avoid compromising the observers.

ix. The fisheries managers should be guided by the FAO species and Area codes when implementing data collection in their fisheries and aquaculture

x. Ensure that the data collected in the coastal states (national boundary) water is the same as the high seas fisheries particularly for the straddling stocks i.e. harmonisation of standards for data collection

xi. The member states expressed concern over underestimation of total fishery production from their EEZs due to the conditions of reporting data by FAO, e.g. reporting of catch data by flag states, Within the provision of international best practices in fisheries and aquaculture statistical data reporting, participants therefore called for a situation where member states are also able to store and report on fish catches from their EEZs as accurate reflections of their total fisheries production

6 CLOSURE

Closing statement was given by Dr. Simplice Nouala, Chief Animal Production, on behalf of the Director of AU-IBAR. Prof. Ahmed Elsawalhy

Dr. Simplice Nouala, the Chief Animal production officer gave closing statement on behalf of the Director of AU-IBAR, Prof. Ahmed El-Sawalhy, He expressed appreciation to the Government and people of the Federal Republic of Nigeria for the opportunity to host this event as well as for the enabling environment the workshop was conducted. This, he continued, is a candid reflection of the true spirit of commitments by the Government of Nigeria to the aspirations of the African Union in the organization's desire to harness the potential of its natural resource endowments for the betterment of the continent's citizenry.

Dr. Nouala commended the lead training consultant Dr. Pete Fielding of the consultancy firm OLRAC for effectively accomplishing a very successful training programme on strengthening the capacity of AU member states on fisheries data analyses, interpretation for informed decision making in the fisheries sector in the various member states. In equal measure, he praised the facilitators, Prof. Benedict Satia, Prof. Paul Onyango and Dr. Andrew Baio, for broadening the horizons of the fisheries managers on the continent beyond setting biological targets as sole fisheries management goal but to take into consideration economic, social, environmental and international best practices for rational fisheries management.

He paid glowing tribute to the participants for the interaction and searching questions during the entire training period and which, he noted, was an indication of the effectively of the intended impact of the workshop. He admonished the participants to put into practice the knowledge they have acquired for improved management of their fisheries.

Dr. Nouala thanked his AU-IBAR Colleagues, the interpreters and hotel staff for their contribution in ensuring a successful workshop.

ANNEX 1: LIST OF PARTICIPANTS

TRAINING WORKSHOP ON CAPACITY BUILDING FOR FISHERIES STATISTICAL DATA COLLECTION, ANALYSIS AND UTILIZATION OF SCIENTIFC DATA FOR INFORMED DECISION-MAKING IN FISHERIES AND AQUACULTURE MANAGEMENT,

5TH TO 9TH SEPTEMBER 2016

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